ON THE INFLUENCE OF THE USE OF IRON AND STEEL ON MODERN ARCHITECTURAL DESIGN.

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[Essay, submitted under motto "Three Ages," awarded the Institute Silver Medal and Twenty-five Guineas 1907.]

INTRODUCTION.

GLANCING down the course of Western Architecture from the Greek period to our own time, it becomes apparent that, with the exception of the influence of concrete in the production of the great vaults and domes of the Romans, no new material of considerable structural consequence appeared till the nineteenth century. The evolution of Roman to Romanesque, Romanesque to Mediæval, and Mediæval to Renaissance was the outcome of political, religious, or philosophical change, and latterly of historical research. Each phase of the art was successively expressed in the same stone, brick, marble, and timber as its predecessor. Even the acute structural problem of the vault was solved by the dynamical properties of the pointed arch, and the regular progression of our own architecture from Norman to Perpendicular was accomplished also without change in material.

The influence of any new material on architecture must necessarily be subordinate, not only to the primary creating force of human need, but to the primary controlling fact of human stature. These are perpetual forces, as potent to-day to maintain, as they were in the early ages to mould, the architectural forms which we have inherited. Our architecture is further founded on and interwoven with the æsthetic ideals of Western civilisation. Steel must first, through the structure, modify these ideals before it can exercise an influence on at least the æsthetic aspect of architecture in anything like proportion to its structural possibilities.

Timber has contributed its natural form to Art, stratified rock has influenced building, many natural forms have been drawn into its service, but iron has no such contribution to bring to architecture. It is in its natural state without form, and is more or less minutely distributed in other substances. Compared even with clay it must be laboriously won and fashioned for human use.

Our ordinary building materials are the selection of centuries of experience, and it follows that a new material will exert its influence in the degree that it is suited to replace or combine with the old, and in the degree that its novel characteristics render new developments necessary. As iron and steel serve purposes previously served by stone, brick, and

timber, we must therefore expect their more direct influence to be extended in the proportion in which they are superior, and limited in the proportion in which they are inferior, to these materials.

The influence of iron and steel will not be restricted to that which they may directly exert by their presence, but we may also seek to discern what new philosophy their novel structural incidence will add to architecture, or what old philosophy they will stimulate and quicken into active life.

It is a new thing in at least Western Architecture to have a material necessary in cases, but not of universal application. The old materials were before this phase structurally suited to the greatest and the humblest buildings. The peasant's cottage might not have the rare imported marble, but it was built in the local material, even if that were marble. Marble, stone, brick, and timber were used in the whole body of architecture; but structural steel will not be used in the whole body of architecture. It is not suited to our cottages, we do not want it in our churches, and it is only required to a limited extent in our largest houses.

Steel will influence architecture in its own sphere on lines an indication of which will be attempted below, and as it thereby influences the æsthetic perceptions of the architect its influence will be reflected in the remainder of the art.

Although in the fullest sense of the word architecture includes such structures as great railway bridges and other engineering works, it is presumably intended that the term Architectural Design be confined to the structures ordinarily within the scope of architectural, as distinguished from engineering, practice. In any case such structures have far exceeded the dimensions possible in the old materials. They have passed the phase of being merely influenced, and reached the stage of being wholly created by steel along with mathematical science.

Historical Note.—Iron has of course from a remote date played a minor and occasional part in architecture, but as now used is a comparative innovation. The rolling of iron was not invented till 1784, although a moderate use of cast-iron columns and beams was made at an earlier date. Our present *steel* construction is only in its third decade, having, after the institution of the Bessemer process, appeared in the market as a building material so recently as 1885. Twenty odd years is a trivial period as time is reckoned in the story of architectural evolution, and the influence of iron and steel on architectural design must be regarded as a thing in its infancy. The assistance of iron chains was invoked in the construction of the great Dome of Florence and our own St. Paul's, and iron tie-rods were at times used in both Mediæval and Renaissance arches and vaults. These may be regarded as incidents, not without their influence, but in no way parallel to the present-day use of iron and steel, and in no essential principle diminishing its novelty.

CAST IRON.

The Beam.—Cast beams and columns were in use in the eighteenth century, long before rolled iron was available as a building material, and till late in the nineteenth century the cast-iron beam with its heavy bottom flange was frequently employed to carry walls and partitions over voids. Requiring less space than the arch, and no abutment, it was in its time welcomed as a more durable and seemly means of bearing stone or brick walls than timber. In recent times we have seen the cast beam given an external form; and with an architrave moulding masquerading unhappily as a stone lintel. The low tensile strength of cast iron necessitates a section which, compared with rolled iron and steel, is an extravagant use

of metal. The weight, and difficulty of casting large sections, its brittleness, as well as its liability to hidden flaws, tended always to restrict the use of the cast iron beam, particularly in floors; and the superior structural qualities of steel have now almost eliminated it from civil practice.

The Column.—In the form of the column, cast iron is put to a use more consistent with its qualities than in the form of the beam. The lack of tensile strength is here of less consequence, and its great compressive strength is almost alone called upon. The cast-iron column has been in use for more than a century, and is still found a convenient structural form in such structures as market halls, railway stations, shops, and others of like public resort and utilitarian nature. As distinguished from the rolled and built steel stanchion, the cast-iron column is capable of and is generally given in such situations external architectural and cylindrical form. In tall buildings the cast-iron column is also used, in some cases in preference to the rolled steel stanchion; and when enclosed it is used in hollow square, and in various open rectangular sections.

Cast iron offers more resistance to corrosion and fire than rolled iron or steel, but the same want of tensile strength which prevents its use in the beam limits the sphere of the column to situations where it is free, or can be guarded from lateral stress. It is further limited in its use by the difficulty of attaching its members one to another compared with the ease with which rolled steel forms can be connected by bolts and rivets.

The Crystal Palace.—The widespread attention drawn to iron construction by the erection of the Crystal Palace in 1851 gave an impetus to the employment of iron in building. The skilful use of column on column, the cast lattice beams of 24 feet span and the roof trusses of 72 feet span compounded with angle-irons and cast struts, were new things in such a situation. Deep lattice girders were, however, not adapted to ordinary buildings; the day of at least the cast beam was near its close, and a new influence in rolled iron was at hand. Apart from its influence on following exhibition and special buildings, the employment of cast iron in the Crystal Palace was more an initiatory factor in the development of iron construction than a direct influence on architectural design.

The influence of structural cast iron on architecture is similar to but less than that of structural steel, and it may be said that to a large extent its influence is contained within that of the newer material. It should, however, be noted that in so far as cast iron was first in the field, and prepared the way for rolled iron and steel, it initiated the influence of the latter.

It is singular how little attraction cast iron, and the column in particular, seems to have had for the architect. How rarely we see cast-iron forms evincing any evidence of artistic skill in their external design, or indeed which are of any but the crudest commercial pattern. When we consider the pleasing surface of a "fine" casting, and the pains taken and success attained in the production of grates, both of the eighteenth century and our own time, it is all the more remarkable that the design of other forms of cast iron should so rarely be the work of educated men. The considerable possible influence of cast iron must consequently be relegated to the class of "Might-have-beens." The probable explanation is that the age of rolled iron and steel had arrived before the need of cast iron was general enough to lead to its æsthetic development.

THE PRESENT USE OF STEEL IN BUILDINGS.

Introductory.—The use of iron and steel has steadily and rapidly been increasing during the past twenty or more years. Steel and concrete, or steel and fireclay, floors are almost universal in considerable buildings of all classes. In nearly all our large commercial buildings

floors are carried—at least where they require internal support—on steel stanchions cased in concrete or terra-cotta which is faced in its turn with marble or plaster. For many years our roofs of considerable span have been framed with steel, but covered with timber and slate or lead as in the past. Such structures as theatre galleries have also for the same space or longer been framed in steel concealed, in this case as in the others, first in timber and plaster, and latterly with concrete or other incombustible material. In some cases we have arrived at the complete steel frame, where beams and stanchions undertake the whole structural duties, the only function left to the wall being the exclusion of the weather. In the United States this system has been carried a step farther; the "skyscraper," compelled by congested city areas, has by reason of its great height rendered the independent wall standing on the ground impossible. A wall 300 feet high, even if it did not carry any floors, would at the lower stages require more space to provide for its own weight than is economically practicable. The result is a separate wall on each story resting on an attachment to the steel frame—a state of affairs new in architecture, and one which may, if it endures, wield a great influence on the old architectural forms, but which it has so far most notably failed to do. Viewed externally, the skyscraper is, except for its height apparently, as other buildings are, and only some mental calculation of the area necessary to the apparent stone or brick piers on the lower floors will reveal the fact that other than the old building methods must have been employed.

The Beam.—Perhaps the leading effect of the steel beam on architectural design is, as ever with steel, an immediate economy of space, and when considerable span or weight is dealt with an economy in cost also. With its aid apartments can be planned and openings provided in our ordinary civil buildings of a width which in past times would have involved a monumental construction to effect. Small apartments may be placed over large apartments, and complicated structures devised with a facility absent in the days of the timber beam and the vault. Where the girder replaces the arch the space previously occupied by the spandrel is no longer required for the construction, and the full height of the opening is extended to the whole width of its span. The effect is that the whole height of the structure may in many cases, such as bridges and gateways, be diminished by the height of the rise of the arch. The abutment also may be reduced in consequence from what was required to take the thrust of the arch to what is sufficient to support the superincumbent weight.

The use of steel has gone far in determining the design and facilitating the provision of such buildings as public libraries, baths, and halls. While it would be idle to pretend that buildings of this class could not be erected without steel, it must be conceded that the economies and conveniences of steel, particularly in the diminished area of supports, have, as well as influencing their design, influenced their utility and number.

A type of building which owes perhaps more to steel than others is that which is built for commercial uses in large cities. The walls are built probably conforming exactly to the form and extent of the site; a staircase and elevator are provided, and the floors are constructed in steel and concrete, with as few stanchions as possible. Each floor is then left as one apartment to be subdivided in any way which suits the occupant, irrespective of the position of the beams or the subdivision of the floor below, a proceeding which the strength of the floor provides for.

The Beam and Stanchion.—One influence of the steel stanchion on modern architecture is to accentuate and carry farther the effect of the beam. The economies which the beam effects on the sectional solids are extended in an increased degree by the stanchion to the floor, the wall, and pier. In its full development the beam and stanchion construction displaces the structural motive of the wall altogether. The wall becomes merely a division or an enclosing screen, sufficient if it is sound and weatherproof and able to carry its own weight. By beams the

weights are concentrated on a series of points, there to be borne by a material fifty times stronger than brickwork per unit of sectional area under working conditions. The consequent tendency is to plan such buildings in a way to utilise to the full the properties and economies of steel—in other words, to plan in a series of uniform rectangles marked by ranges of beams supported at the intersections by equally loaded stanchions.

One might be excused for presuming on first thought that the steel stanchion and beam would exercise a general influence on Architectural Design tending to their expression in piers connected by horizontal strings or bands, and that, on the whole, the influence would be towards a vertical effect. We might also expect to find this influence increasing as the use of steel increases from the floor beams only to the complete steel frame. The facts, however, seem to show that generally the reverse is the case, and that the pier effect is at its greatest when beams only are employed and decreases as the use of steel increases. When steel beams at considerable intervals are supported on the outer walls the weight that each beam concentrates at a point necessitates a pier, and the fact that the beam carries the whole floor weight renders a thinner wall possible in the intervening spaces. Here we have the pier façade at its point of greatest emphasis. When, however, the outer ends of the beams are carried by steel stanchions, the apparent pier consisting in the stanchion and its enclosing material requires, in the case of any considerable building, much less mass than the built pier in the first case, and the vertical effect is consequently minimised. Then, again, with the steel frame; when the wall of each story is carried on attachments to the stanchions, the convenient method of making these attachments on the outside of the stanchions leads to the walls being carried from end to end of the façade in an unbroken plane in front of the stanchions. Consequently the tendency is away from the vertical and towards a uniform plane, or even a horizontal treatment—for instance, the New York Sun building.

The fenestration is even more influenced by the presence of steel construction. When the weight of the floors is distributed along the walls by joists at short intervals, the architect enjoys a comparative degree of freedom to vary his scheme of voids and solids from floor to floor. When, however, the burden of steel beams imposes massive piers, the windows are of necessity ranged one over another and their variation restricted to their arrangement in groups within the bays. The external steel stanchion, although it may diminish the mass of the pier, or in the tall building even result in a uniform wall plane, imposes by the fact of its presence the same limitation. The incidence of the piers and the consequent thinning of the intervening walls tend to the enlargement of the windows and to the filling the entire width of the bay with a mullion and transome fenestration and to a general lightening of architectural detail. This pier and window phase of architecture is of course no new thing, it bears a superficial resemblance to the structural elements of certain examples of late Gothic work. It is curious to note how in different ages two types were evolved having some elementary affinities with each other by motives and methods so different. In these late Gothic buildings, skill, experience, and native wit in pursuit of an æsthetic ideal produced structures of an airy lightness. There the thrusts and weights are balanced on such a minimum of supporting area, and the structural qualities of stone are utilised in a degree so full and in proportions so far removed from those natural to it, that the result is a veritable triumph of mind over matter. The production of structural steel is also a triumph of mind over matter, but the forms of structural steel, although not the natural form of iron, are forms natural to it. The more scientific skill of our own day, in the pursuit not of an æsthetic but of an economic ideal, has produced a construction parallel in the aspect in question to the mediæval phase cited.

To realise the full significance of the economy in space incidental to the use of the steel stanchion, it will be well to compare an example with a brick pier of similar strength.

Assuming that in the middle of an hotel dining-room, sixteen feet high, it is necessary to support a load of 160 tons imposed by beams on a pier or stanchion. A blue brick pier bearing with safety ten tons per superficial foot would occupy a floor space of sixteen superficial feet and would measure, say, 4 feet square. A stanchion to carry the same weight could be built up in steel to the overall size of 16 inches square, or, including fire protection, say, 20 inches square. The resulting area would be 2·77 superficial feet, or about one-sixth of the area of the brick pier, disregarding the space required for the finish or decoration in both cases.

Supposing, as is likely, that the brick and steel columns were carried up through a number of floors, each of which contributed a share of the load, and that their dimensions were diminished as the load decreased; the result would be that the upper part of the brick pier would in its own substance add a material weight and consequent increase of area to the pier in question, while the additional weight from the stanchions on the upper floors would be trifling, and a further economy falls to the credit of steel.

When we consider the difference in mass between columns of 16 and 2·77 superficial feet, the influence of steel on the architectural treatment of the apartment is obviously radical. Properly considered, the scale is altogether changed and the parts generally lightened. While the dimensions of the brick pier would dictate a pier treatment, the stanchion will permit a shaft treatment, or lend itself to the perhaps unwholesome expedient of enclosure in the form of a classical order.

The Roof.—It cannot be said that structural steel has influenced modern architectural design in its application to the roof to anything like the extent that it has done in the form of the beam and stanchion. Many constructional and other considerations limit the convenient span of a timber floor to about twenty-five feet, and, except on occasions, forbid the use of the arch or vault in its construction; but no constructional reason compels the use of steel in framing our roofs. Our climate and traditions have imposed a pitch of roof which, besides eliminating any question of space occupied, gives such scope for the economical use of timber that timber is structurally capable of spanning openings far wider than our ordinary needs demand, even in public buildings Nor does the weight of a steel roof differ from one of timber sufficiently to influence design through the creation or solution of any structural problem. Requiring the same covering as a timber roof would, it cannot exert any influence by external expression.

Among the earlier applications of iron to a whole architectural unit were the open roofs of such buildings as railway stations and markets. The demonstration that the constructional elements of iron or steel in these situations are capable of a simple constructional grace has, by creating for at any rate these interiors new standards, done something to slacken the force of architectural tradition in its æsthetic sense. It cannot, however, be said that such a structure skilfully and consistently designed is any departure from architectural tradition in the full sense of the words.

Steel is, and will continue to be, the constructional roofing material of many important buildings, not only because it is incombustible but because it is capable of combination with other incombustible materials, such as concrete, in a way which timber in a roof is not. Setting aside meanwhile the questions of durability and consistency, it is hard to see what influence on architectural design the steel-framed principals concealed behind timber or plaster vaults in many modern churches and halls will exercise, save a certain facility in execution and a tendency in favour of the ceiled and against the open roof.

The Floor and Ceiling.—The immediate influence of steel in the floor is curiously erratic, and that influence is of course exerted on the ceiling below it. We may use slight

steel beams enclosed in concrete, or reinforced concrete itself, in work of a modest scale, and only emphasise the tendency to the familiar flat plaster ceiling, already exerted by the simple joisted floor. We may replace the binding girders in a framed timber floor by steel beams, with the result that we cannot show real timber beams, and although we may hang down a flat ceiling in both cases the reasonable influence is towards a plastered beam treatment. Thus we see the lesser change exerting the greater immediate influence. We may, further, floor our apartment with concrete supported at intervals by steel beams, and by bringing the concrete from a point clear of the top flange down on an inclined plane to the bottom flange, show a concrete ceiling with concrete sided beams. This is a new form demanding a plaster treatment, and often receiving it happily. The general influence of steel alone in the floor is small, but, when accompanied by concrete or any fireproof material, the influence is towards a plaster treatment applied directly to the constructive form. The difficulty, in the case of a fireproof floor, compared with a timber floor, of fixing brackets tends to the omission of heavy cornices and enrichments and to the introduction of a lighter decoration, and the same circumstance exerts an influence adverse to the formation of coves or vaults.

The Tall Building.—There are in the genesis of the skyscraper, setting aside the social conditions which demand it, two essential factors—steel and the elevator. Without iron or steel the twenty- or thirty-story building would be commercially impossible, and without the elevator it would remain unoccupied above the fourth or fifth floor. These buildings are more than towers, on the scale generally understood by the word. They are large city buildings of an ordinary commercial type, which the strength of steel has projected into the air to such a height that they assume the form of towers by sheer greatness of height in proportion to length and breadth, and are vast structures containing hundreds of rooms and an equivalent population. Apart from the creation of this new thing, with its new problems of planning and construction, it is not clear that steel in the skyscraper has influenced the forms of architecture any farther than it had already done in its more modest applications. So many constant influences are at work to preserve the forms of architectural detail from revolutionary as distinguished from evolutionary change that our generation will probably see little of whatever influence this type of construction is ultimately to exert on our art.

As previously noted, to construct a twenty- or thirty-story building wholly in brick or stone on an ordinary scale would result in piers occupying so great a proportion of the area of the lower floors as to make the building economically impracticable. This is a point so essential that at the risk of seeming to insist on the obvious the diagram on the following page has been prepared to illustrate it.

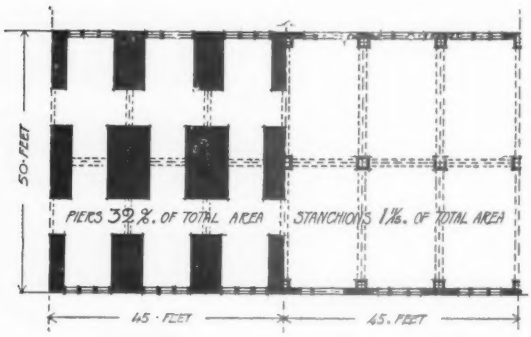
In diagrams I. and II. [p. 696] the respective ground floor areas of the brick piers and the steel stanchions necessary to support a tall, and an ordinary, city building are compared. The building assumed is a commercial one utilised as shops on the ground floor and offices on the upper floors, the depth is fifty feet divided laterally by one row of columns, and from back to front by columns into bays of fifteen feet from centre to centre. In figure I. it is demonstrated that if we attempted a building twenty stories high and allowed for floor and load the moderate average weight of one cwt. per foot, and took into account the brick piers' own weight and that of the outer walls, the resulting piers would occupy 32 per cent. of the total ground floor area.

The same diagram shows that if a similar building were framed in steel the resulting area of the supports at the ground floor, allowing for their casing, would be little over $1\frac{3}{4}$ per cent. of the total.

In the case of the twenty-story building there is no choice but steel, but in the

six-story building illustrated by diagram II. as more within the scope of British practice the brick piers require only $4\frac{2}{3}$ per cent., and the steel stanchions less than $0\frac{5}{16}$ per cent., of the floor area. Here, of course, there is a choice, as the four or so per cent. difference in floor area is not always material. In many cases, however, the advantage to be gained in the reduced obstruction to sight and traffic would tend to the selection of steel.

DIAGRAM SHOWING THE COMPARATIVE AREAS OF THE BRICK PIERS AND STEEL STANCHIONS NECESSARY TO SUPPORT A TWENTY- AND A SIX-STORY BUILDING.

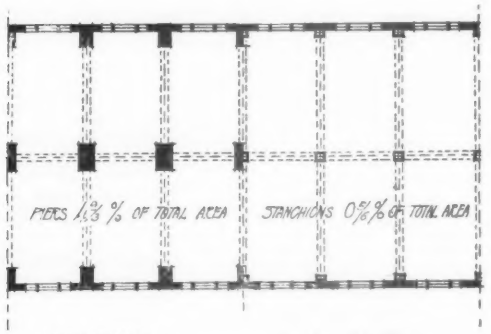


Brick building. Steel-framed building.

PLAN OF TWENTY-STORY BUILDING.

Centre piers 14×8 feet.
Outer piers 11×6 feet.
NOTE.—The greater part of the area of these piers is required to support the brick's own weight.

Centre stanchions, built of rolled steel within a square 1′ 9″, with enclosure, calculated as 2′ 3″ square.
Outer stanchions ditto ditto but steel within 1′ 5″ square, and with enclosure calculated as 2′ 0″ square.



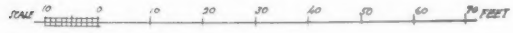
Brick building. Steel-framed building.

PLAN OF SIX-STORY BUILDING.

Centre piers 5×3 feet.
Outer piers 4×2 feet 6 ins.

Centre stanchions built within a square of 1 foot, with enclosure, calculated as 1′ 6″ square.
Outer stanchions ditto ditto but steel within 10″ square and with enclosure calculated as 1′ 4″ square.

NOTE.—The floors and their loads and the roofs are taken at 1 cwt. per foot. The weight of the brick is taken at $1\frac{1}{2}$ cwt. per cube foot and its safe load as 10 tons per superficial foot. The height of the twenty-story building is 220 feet.



The steel frame in certain tall buildings contributes a new structural element to architecture. Hitherto we placed stone upon stone and brick upon brick, trusting with justifiable confidence to the weight of the materials and the moderate proportions of height to base dimensions for stability under great wind pressure, and in the case of such structures as monumental columns trusting to the sole employment of the heavier materials. Our buildings were laid upon the earth and built without vertical bond save the adhesion of the mortar. The tall building has in cases exceeded the old moderate proportion of height to base, and with its lighter walls has not the old stability of weight. It seeks stability by a method new to civil architecture. From roof to foundation the parts are riveted together into one continuous structure, attached to its foundations, buried deep, and anchored to the earth.

It would be rash to assume that the tall buildings of America, or even such high buildings as our own laws permit, or may permit, are a permanent institution. They are not a natural human need, and it is to be desired for hygienic, if for no other reasons, that the already great congregations of men gathered together for the space of a business day should not be further increased. Improved means of locomotion have already gone far in promoting men's dispersal over wider areas for residence, and it is to be expected that the improvement of other means of intercourse will diminish the necessity for the close congregation of men for commerce, and at the same time diminish the concurrent cause of high building, the high site value. We should therefore seek the

influence of steel, more on planning, construction, and architectural detail of buildings of a normal scale.

In the employment of structural steel with its active qualities, in conjunction with the passive qualities of the older materials, there is the undoubted loss of a measure of structural consistency. Steel, however, must be used on occasions for reasons beyond our control, and it is not good that we should regard the coincident loss of consistency in an attitude of proverbially vain regret. Regret in concrete matters leads nowhere; we cannot stem the tide of steel, and it is not clear that it is on the whole a tide of evil. In all change there is gain as well as loss, and we should rather seek and cultivate the good in the principles of design emphasised by steel, for in no other way is progress possible. Much was lost when Greek Art was swamped in the flood of Roman Art, but the Romans led architecture into wider spheres. Much was lost to Art in the fall of the Roman Empire, but a new and purifying influence led to the triumphs of the Middle Ages. The egg of evolutionary sequence was broken by the Renaissance, but a rich omelette resulted for Western Europe.

The Shop Front.—The blame of the paradox of the shop front must, after the economic causes, be laid on iron and steel. The city proprietor pays for a property a price which requires the utmost rental return; the shopkeeper, to whom he lets the ground floor in order to meet this rent, requires under the stress of competition the utmost width of shop window possible. Differing occupations, climatic and other reasons require that the upper floors should be walled in stone or brick. Hence we have a substantial stone street building standing apparently on little more than sundry sheets of plate glass and thin brass bars, the real construction of steel beams and stanchions being concealed by wood, terra-cotta, granite, or what not. Much ingenuity has been expended (largely in vain) to give this anomaly constructive, or apparent constructive, consistency. Sham flat arches of impossible span, and sham segmental arches with sham abutments of ridiculous insufficiency, meet us everywhere in streets, and only add to the incongruity. No application of present-day architecture can conceivably solve the problem. Here, therefore, is a chance to express our steel, and possibly the increasing use of steel will lead to its being taken, and the anomaly being at least minimised.

It in no way affects the question that in certain cases shop fronts in harmony with the remaining architectural composition have been and are being built; these exceptions prove the rule, and they can only occur on occasions when commercial considerations do not dominate the situation, and the necessary width can be appropriated to the piers.

Reinforced Concrete.—In reinforced concrete we have a material containing structural steel in a form utterly different from the structural steel hitherto considered. Instead of scantlings of steel capable alone of the structural needs of their position, we have scantlings and forms of steel incapable alone of any structural function, combined with concrete in a manner calculated to bring into play a high degree of their potential strength, and to contribute to the combination the tensile strength which concrete alone lacks. While steel in a steel frame construction forms merely the skeleton of the building, and possesses certain active qualities incompatible with its external clothing, reinforced concrete is, in comparison, a homogeneous material, not only capable of forming the whole building but capable also of external expression in its own material.

Reinforced concrete has already up to a point proved its fitness—in bridges, warehouses and other buildings; and, assuming that the lapse of time confirms its fitness and proves its durability, its influence on architectural design may within limits be very great. The sphere of influence possible to reinforced concrete must, however, be delimited by its quality. It is what may be termed a rude material. One cannot conceive a Parthenon or a triumphal

arch of reinforced concrete, even if veneered with marble. Reinforced concrete does not lend itself to clothing in other materials with the readiness of brick or stone, and, supposing a monumental building were erected with it, faced with finer materials of sufficient thickness to secure for themselves the desirable degree of permanence, the structure would become by that fact something more, or less, than reinforced concrete.

Within these limits the plastic and monolithic character of reinforced concrete threatens to wield a vast influence on architectural forms. With reinforced concrete the structural meaning of the arch disappears, with its voussoirs and its orders of voussoirs, and all their innumerable forms and mouldings, and the living form which moulded the development of architecture for fourteen centuries becomes a dead form. The logical coincidence of void over void and solid over solid is removed so far as a building material can remove it.

The lintel too, owing to the monolithic quality of the material, loses its meaning and expression, and the column, while retaining both, loses the traditional capital and base in their original structural capacity. The cornice, necessary as ever in its sheltering junction, must undergo great change when in place of being built stone on stone, and balanced on or corbelled from the wall, it is cast in one piece with the rest of the structure.

Many, or perhaps most, of the other forms of Western architecture have constructive meaning incidental to the older materials and inconsistent with the new material. We may, therefore, expect that reinforced concrete will, within its province, eliminate the non-essential and mould to its manner the essential of the old forms.

Minor Effects on Practice.—The use of iron and steel construction compels a more final determination of the design on paper than a brick or stone construction. In the older construction the architect had a greater freedom to alter and amend the work during its progress as the initial ideas elaborated and developed in his mind—an important matter to men of a certain temperament. In the newer construction this facility is restricted; for example, to omit or remove a stanchion from a steel-framed building involves a far extended derangement of an exactly calculated structure, while to remove a pier in a brick or stone building and substitute a beam is a much simpler matter. Again, a deviation necessitating the cutting of timber beams or joists is easy compared with a similar operation on steel beams. Timber or stone can be delivered at the work in full dimensions, there to be shaped for its position at the last moment; but steel must leave the smith's shop prepared exactly for a predetermined situation. The need of precision and foresight on the part of the architect is accentuated by the use of steel and by the speed at which a steel-framed building is erected. When a twenty-story building can be framed up in less than three months, and when the lower floors are being finished before the steel frame has reached the roof, the architect may not study his details with the old leisure.

Undoubtedly architecture has benefited at some hands by the time for study allowed by the older construction, but it would be foolish to leave unconsidered the counter-balancing advantages. Precision and foresight are virtues, and if steel is a discipline to inculcate them the fact of this influence must be placed to the credit of steel.

Some Minor Uses.—The cumulative influence of iron and steel in their many minor applications is considerable if we compare our own time with, for instance, the eighteenth century. The choice between timber sashes and casements and iron casements with the heavy sash bars of the former, and the lighter bars or leaded glazing of the latter, makes a difference to the architectural feeling of a building so marked that the general design must to a large extent lead up to the type of glazing employed. As wrought iron in the casement compels very light bars or leaded glazing, it appropriates a portion of this influence as its own. With structural steel open wells without pillar supports, and open flying stairs, can be arranged with

increased ease, and iron spiral stairs and iron galleries can be devised in a space much less than if timber or stone were used. These and numerous applications of iron such as straps, hangers, and knees, tend to slacken the rule of the old grammar of planning in some of its details. Steel, however, enforces a grammar of its own which is not perhaps in principle very far removed from the old.

Present Influence.—Although structural steel is often clothed in the familiar architectural forms, it does not, except so far as already indicated, directly influence them because it is *steel*; but it does influence architectural form in the incidence of its enclosure. Steel, and the materials in which it must in ordinary cases be enclosed, are things so different that they cannot be built up together, and the old forms are less convenient clothing for them than thin slabs with their appropriately simpler architectural treatment. Steel will also influence architecture more indirectly through the changed proportions it effects. As the beam gives increased span and compels a trabeated form, and as the stanchion tends to increase the proportional height and diminish the absolute area of supports; and as the steel frame gives us buildings of a hitherto unparalleled height, borne on bases of a previously impossible area; it is through these strange proportions that it will further influence architecture, and not because it can embody a steel architecture or alter the many essentials which are the creation of other influences than those of materials.

A building may be framed in steel, but it presents to our eye the same brick or stone exterior and the same plaster, wood, and marble interior as if it were constructed in the older manner. The influence of the texture and colour of the brick and stone remains on the forms they are required to assume, although their structural influence may be undermined by steel. The close grain of the marble responds to delicate gradation of surface as before, and the influence of its figuring towards its exhibition in plane rather than heavily moulded or sculptured surfaces remains, perhaps augmented by the presence of steel. The influence of the surface and substance of plaster remains on the forms it embodies although the changed method of its application to steel construction exerts a coincident and conflicting influence. The influence of our tile, slate, or lead roof coverings remains little affected. We cannot build our walls, cover our roofs, or line our interiors wholly in steel; steel is not sufficiently durable for convenient exposure, it conducts changes of temperature more than our ideas of comfort would endure. Our ordinary needs in the matter of ventilation are founded on the use of porous building materials, which, of course, steel is not; and if we attempted to live in a steel-clad house startling effects in these and other respects would ensue.

We may dismiss the idea of a metal architecture until we have a metal of the durability of copper, the strength of steel, and of the porosity and other passive virtues of stone, and nothing but an occasional building for some special purpose can be wholly constructed in iron and steel. Meanwhile the old and the new must march together. The old must lengthen its stride to its utmost, but to that utmost steel must confine its own gait.

Steel will exert a new or at least stimulate an old influence in the disruption of the structural material and the external form. When a building is constructed wholly in marble or wholly in stone, the columns, bases, capitals, cornices, archmoulds, and other traditional forms retain their full significance, both structural and æsthetic; and even when the interior of a wall is built in stone, and the external forms in marble, the structural incidence of these materials being identical no new influence is thereby set to work. When, however, the heart of the wall is of brick, the small dimensions and rectangular form of the brick lend themselves to the building in of narrow bands, and to the facing of the wall with thin slabs of the finer materials, and so to an architecture of simple planes where the effect is sought in the general form of the masses and in the intrinsic beauties of the materials in a greater degree,

and in moulded or sculptured forms in a less degree, as in Byzantine and some phases of Italian Art.

This influence is accentuated by steel construction, when it becomes impossible to build the clothing material in with the structural material, and its full force is probably not yet felt, but must doubtless in our interiors tend towards marble, veneer, mosaic, and painted and plaster decoration.

The use of the complete steel frame is so far, and is likely to remain for the present, restricted to well-defined limits. The chief of these is the city site of high commercial value on which it is desired to build, for example, an hotel, or a large retail shop. In both instances steel can contribute economy in space and speed in construction, and if not fireproof it has at least the parallel quality of incombustibility. To the warehouse and factory class of buildings steel contributes not only the virtues just referred to, but the strength and elasticity demanded in buildings of many floors bearing heavy loads and moving machinery.

On the other hand steel construction is not likely to invade ecclesiastical architecture or, excepting very large town houses and flats, domestic architecture; nor is it likely to invade any class of rural architecture save barns and the like. In point of fact it is not used except where problems of economy of space, money, time, fire risk, or all four compel us to utilise its one good quality, namely strength, with its concomitants, including incombustibility. In the vast majority of buildings these problems do not present themselves in a form acute enough to tempt us to use a material, or at least to adopt a complete construction in a material, so susceptible to corrosion and so unsuited to exposure as steel.

However restricted in sphere the influence of steel on our current architecture may be, steel must have a far-reaching and adverse influence on its permanence. If stone and brick piers are replaced by steel stanchions, and walls are built thinner in consequence, we cannot expect the buildings of our day to endure as the monuments of antiquity have endured. No doubt with care and attention the steel work in a modern building may last for a few centuries, but let us consider what will be the state of a great building framed in steel to-day when it is the age of, say, the Pantheon.

Western history gives no grounds for the supposition that one *régime* can last for such a period of time as the Pantheon has existed. The Pantheon is what may be termed a permanent building containing in its walls and roof nothing less enduring than concrete, masonry, and brickwork, and these in great mass, and in consequence it has survived and can survive long periods of neglect and all manner of abuse short of demolition.

In the same manner such a building as an early French church, with its massive walls, stone domes, and external stone roof, will survive the same vicissitudes of fortune. It seems irresistibly clear that a steel-framed building, or a building constructed largely of steel, will have ceased to exist long before it has reached the nineteen hundred odd years of the Pantheon.

Steel as we know it requires care for its preservation, and care it will not get for more than two or three centuries at a time. New developments or fireproofing science may preserve it from fire, but no human skill will preserve it from the neglect and violence of recurring revolutionary periods which no architectural monuments will endure, save such as are built in great masses of inert materials. Neglect and violence are things which steel will *not* endure, and when we consider its perishable nature and other unstable qualities all evidence seems to point to the life of structural steel, even with care, being limited to two or three centuries.

Supposing one age of architecture adopted a material so perishable that the lapse of a few centuries swept its examples off the face of the earth, it does not follow that the art and

material presumed would cease to have any influence on architectural evolution. The influence of the architecture of one age on the architecture of the succeeding ages is twofold, the first being its contribution of form and method handed down by tradition, and the second, the direct example of its surviving monuments to the remoter ages. In the first aspect steel will be the means of contributing much to architectural tradition, but in the second aspect it will not be an influence at all.

CONCLUSION.

It is hardly possible to appreciate the present influence of iron and steel without attempting to observe the trend of that influence, and consequently speculating on at least some aspects of its future extent.

It should not be presumed that a material with so many unstable qualities has come to stay for any considerable time as a structural building material. Steel at this moment, whether in the complete frame or the beam over the shop window, is an economic necessity, but the economic conditions which under our social conditions have created that necessity are not permanent, but are and have always been changing.

No conceivable change in social conditions could diminish the utility of the Forth Bridge or render its erection possible in any material other than a metal of great strength. Even if steam traction became obsolete the new traction would still require the great steel- and glass-covered area of the railway station. No very great change in social conditions or public sentiment, however, is required to create a revolt against tall buildings, or to remove the necessity for more than four or five floors in all ordinary civil buildings, and with the higher floors would disappear, if not steel construction altogether, at least the heart of the problem of steel construction.

However that may be, the ingenuity and effort spent in attempting the solution of the problem cannot be spent in vain. Every honest effort, successful or unsuccessful, equips the author with knowledge and experience, and braces him for further and higher attempts. Present imperfection is a necessity to progress. The effort to overcome the æsthetic limitations and dynamic difficulties of the round arch so stimulated and quickened the wit of the race of Mediæval builders that the solution in the pointed arch covered our and other lands with architectural glories for four centuries. In the same way, the efforts of our generation to overcome the incompatibilities of steel cannot be in vain. The problem contains the very elements of architecture, and is therefore capable of leading to a forward movement in our art comparable in some degree with the active periods of architectural evolution.

In all probability the use of structural steel is a passing phase, a phase not to be measured by a few years but possibly by generations; but still a phase, and not a permanent institution, as the use of brick or stone. To bear a load sufficiently but not wastefully, to carry it to the earth directly, to balance a thrust exactly, to provide for every stress with skill, to place solid over solid and void over void, and to plan and construct in simple and regular forms, are principles good for all, and common to all art and material. These principles steel requires and imposes in a degree so intensified as to make them almost peculiar to itself. They are the spirit of steel construction, and are as eternal as is Art. The body of steel may pass away, but the spirit will survive to quicken and rejuvenate; and who can say but that our twentieth-century architecture is in need of a purifying and co-ordinating influence?

TEST OF REINFORCED CONCRETE ROOF.*

By J. Ernest Franck [A.].

THE Local Government Board, in giving their sanction to a loan for the erection of the Public Baths and Washhouses, informed the Hammersmith Borough Council that such sanction could not be given for any work in the walls and roof of the first-class bath which involved the use of reinforced concrete, but that the Board would be prepared to consider the matter further if the Borough Council would undertake to test one or more ribs after erection in the presence of one of the Board's engineering inspectors, such test to be carried out under the supervision of an independent expert.

The Hammersmith Borough Council wished to take up the loan, and I was instructed to make the necessary arrangements to test two of the principals. In conjunction with Mr. W. G. Kirkaldy it was decided that the load should be applied in as near as possible a manner as the ultimate load which was to be borne by the principals, and for this purpose cradles were slung from two of the principals in the manner and at the points shown in the diagram.

The ultimate weight of the roofing materials was ascertained from weighing various specimens, as set forth in the table showing the dead load on one side of the principals. The manner of applying the load was by means of bags filled with ballast, each weighing one hundredweight. These bags were all checked in weight by the clerk of works, and a large number of the same were taken haphazard and checked in weight by Mr. Kirkaldy; it will be also noted from the drawing that the first weights given are those of the cradles, which were also verified.

The deflections were observed by Mr. W. G. Kirkaldy from the corridor shown on the right hand, or south side of the principals, by means of a cathetometer sighting on to a mirror having crossed hairs on its face and suspended by two wires which were attached to the upper part of the rib and held in position by loose rings. Separate readings were taken by the Local Government Board engineers and myself of lever indicators fixed, at the various points, on to bearers bolted to the staging used for carrying the centering employed to erect the ribs; but the movements of these levers must be disregarded, as several of the ropes suspending the cradles stretched to such an extent as to displace the lever indicators, and when reset it was noted that the effect of moving the large weight used for testing from the staging on to the cradles caused the former to spring.

It will be seen that there was no spread at the abutments, as shown by the readings taken by means of a horizontal wire fixed at one end carried over a pulley with a weight attached at the other end of the wire; the readings of the pointer attached to the weight under the column J show that no movement took place. The roof was superloaded to an extent of fifty per cent. of the permanent dead load; the greatest deflection measured was only one twenty-fifth part of an inch, and after the removal of the load the roof principals were found on testing to have recovered their original form; in fact, the reading on the cathetometer was above zero, the reason for this being that the cathetometer was set to zero after the cradles were hung, but it showed conclusively that there was no permanent deflection.

The reasons for using reinforced concrete in the principals and purlins of this roof are as follows:—

The greater portion of the length of the south wall of this part of the building is practically a free structure from the ground-floor level, and I was advised by Mr. Gifford Read, my consulting engineer, that as I wished to construct a roof of a semicircular section, and without tie-rods, the roof trusses if in steel should be rigidly connected to steel stanchions built into the walls, carried down to the ground-floor level, and bolted to large stone or concrete bases.

I also required that the face of my bath wall should have no projections in order that the full length could be utilised for dressing-boxes. It will be seen from the sketch diagram that if no projections are allowed on the inner or bath side of the wall, neither could any projections be allowed in the corridors at the sides of the bath, which were to be used as exits when the premises were licensed for music and dancing; although the use of the corridor on the north side was not pressed by the Council.

To have used steel stanchions meant that projections must come on one or other of these faces; but by the use of reinforced concrete the stanchions or continuation of the main ribs were split at the level of the roofs of the corridors and carried across the same in an arch formation, and continued to the ground-floor level on each side of the corridor, and joined again beneath the ground floor; thus the lower portions of these stanchions became box-shaped.

The stanchions on both sides of the bath are brought within one inch of the inner face of the walls and covered with tiles; the outer sides of the stanchions on the south side, where the main wall is next Scott's Road, are brought within $4\frac{1}{2}$ inches of the external faces of the buttresses.

Another of my requirements was a flat soffit to the side cantilever galleries, and this necessitated cross braces in the space between the gallery gang-

* These notes and the accompanying sheet of illustrative diagrams have been received for publication in the Journal through the good offices of Mr. H. D. Searles-Wood [F.], Hon. Secretary of the Reinforced Concrete Committee.

way floor and such soffit. This space I proposed to use as an air duct for heating and ventilating the building, and the braces before mentioned would have impeded the flow of air.

I also considered that, even if the roof trusses had been carried out in steel and covered with two inches of some non-conducting external coating, such a structure would not be of so fire-resisting a nature, and certainly would not be "building in truth," whereas the ribs now showing in the ceiling of this bath are true structurally.

With the roof trusses in steel these must be painted every few years, but with this material there is no maintenance. I do not think the initial cost has been greater than a steel roof truss if the extra works required by the Local Government Board are taken into consideration; such works comprise the buttresses to the principals on the north side of the bath, the continuation of the reinforced concrete as a secondary truss round the skylight, and the reinforcing of the concrete piers on which the stanchions stand with round iron bars hooked over into the feet of the stanchions.

In designing the roof truss the calculations for the reinforcement were made on the supposition that these arched ribs stood independently on the ground-floor level; and, although the weight of the galleries was taken into account, the support such galleries afford in stiffening the main stanchions was neglected.

Taking the concrete of the arch ribs and purlins at $1\frac{1}{3}$ cwt. per cubic foot, and the roof covering at $\frac{1}{6}$ cwt. per square foot, it was calculated that the weight on the half-arch was equivalent to a horizontal thrust of 14·2 tons and a vertical pressure of 18·9 tons.

The wind pressure is calculated at a rate of 50 lbs. per square foot of vertical height of roof, and the proportion of the total wind pressure normal to the surface and acting at the crown of the arch is equal to 2·6 tons.

The maximum bending moment therefore on the corner of the abutment of the arch rib is equivalent to 150 foot tons; and as there is no abutment on the south side to oppose the horizontal force this must be resisted by the arch itself, which must be strong enough at the corner to resist bending as a beam.

The steel bars shown on the diagram of the test of the roof are more than ample to meet the horizontal force at such point, but at the point where the arch rib springs from the stanchion the dimensions of the same are reduced in comparison with that of the concrete at the corner of the abutment; and although the bending moment is less, yet the reduction of the effective depth of the beam requires the above number of bars to be included in order that the stress on the steel be not greater than seven tons per square inch.

The weight calculated to be borne by any one of the stanchions at a point about one foot below the underside of the gallery was a maximum of 32 tons, the section of the majority of the stanchions at such point being 1 foot 5 inches by 1 foot with six $1\frac{1}{4}$-inch bars embedded in the concrete.

Two columns, 8 feet long and 10 inches square, made from the materials employed and having four $\frac{1}{2}$-inch bars, were tested to destruction by Messrs. David Kirkaldy & Son: these columns were eight months old, and crushed at 99 and 107 tons respectively.

The concrete used in the work was composed of clean sharp broken flint gravel of various sizes between $\frac{1}{8}$ inch and $\frac{3}{4}$ inch, mixed with sand and cement in the following proportions:—

Gravel	27	cubic feet
Sand	$13\frac{1}{2}$	„ „
Cement	$6\frac{1}{2}$	cwt.

This results in a mixture of approximately four to one.

The cement supplied was required generally to conform to the British standard specification, with the following alterations to such specification:—

To have no residue			on a sieve of	5,776	meshes	per sq. in.
Not more than	5 p.c.	„	„	14,400	„	„
„	„ 14 „	„	„	32,400	„	„

And the test for tensile strength when mixed with sand in the proportion of three parts of standard sand to one of cement by weight was to be at—

7	days from gauging		200	lbs.	per square inch
14	„	„	275	„	„
28	„	„	350	„	„

The expansion under Le Chatelier's apparatus was not to exceed—

2	millimetres	after 24 hours'	aëration
1	millimetre	„ 7 days'	„

Cubes of concrete, 6 inches square, made from the materials employed were crushed by Messrs. Kirkaldy & Sons in May last. Ten specimens were experimented upon, with the following average results:—

Date when made	Weight dry, in lbs.	Crushed, at tons per sq. ft.
No record . . .	18·32	143·0
19th November 1906 . .	18·15	142·7
10th January 1907 . .	17·92	104·2

One specimen crushed at 170 tons per square foot.

The steel bars were required to bear a tensile stress of not less than 28 or more than 32 tons per square inch without breaking, and to elongate at fracture 20 per cent. in a length of 8 inches.

The average yield point of the specimens was 22·2 tons per square inch, and the average maximum stress borne was 32·3 tons.

The reinforcement of the stanchions below the gallery consisted of six $1\frac{1}{4}$-inch bars, above the gallery of nine $1\frac{1}{4}$-inch bars, which were carried round the principals, with the addition of two

1-inch bars extending for 18 feet at the crown of the arch; that to the buttress on the left side of the diagram consisted of two $1\frac{1}{4}$-inch bars, and on the right side of four 1-inch bars carried over the arches extending across the corridor.

There were also two $1\frac{1}{4}$-inch bars carried round the secondary trusses supporting the skylight.

The average overlapping of the bars was 6 feet, no welding being allowed.

The large purlins were reinforced with two $\frac{1}{2}$-inch bars, and the smaller ones (for carrying the fibrous plaster ceiling) with one $\frac{3}{4}$-inch bar.

The side cantilever galleries were constructed with brackets opposite to the principals, having 1-inch diagonal circular bars carried across the air space, and reinforced between these brackets with $\frac{1}{2}$-inch bars spaced 15 inches apart. Two $\frac{1}{2}$-inch bars fixed longitudinally between these brackets were placed next the wall and also beneath the step formed in the gallery; in addition round rods $\frac{5}{8}$ inch in diameter are placed on the outer edge and all round the gallery, also a 1-inch bar in the wall at the upper side of the same, and around which the 1-inch diagonal bars are hooked.

The reinforcement in the concrete bases built by the general contractors below the ground-floor level consists of nine $1\frac{1}{2}$-inch diameter round bars.

In work of this character too much stress cannot be laid on the supervision of the workmen engaged, and that such was exercised by the clerk of works is shown, I think, by the result obtained by the test.

LIME BÉTON.

MR. R. P. SKINNER, the American Consul-General at Marseilles, gives the following description of the preparation and uses of lime béton in and about the neighbourhood of Marseilles:—

Lime béton has been in longer and more general use than cement concretes. It was a first-class material when made with ordinary quicklime, and since hydraulic lime has been used it is better. It is a cheaper composition than cement béton or concrete, easier to work, and if the initial load be not too great it is for nearly every purpose just as good. A good lime béton can be obtained by mixing mortar and stones, gravel or cinders, mortar and good-sized stones making the best composition. Probably one-half of the houses in Marseilles have been built of this material, and thousands of the older buildings, many hundred years old, are held together by ordinary lime. Walls built of quicklime béton must be laid up slowly, but with hydraulic lime béton they can be erected as fast as masons can work. The solidity of lime-béton construction is shown by the sea walls and docks in Marseilles, where masonry of this kind may be seen both above and below sea water, the most difficult test to which building material can be subjected.

The lime is weighed out to the cubic unit of sand, and the two dry mixed. Water is added slowly with a sprinkler and the plastic consistency tested by forming a ball with the hand, which should exude a slight moisture, and being laid aside should neither flatten nor crack open. A mortar of 500 kilos. (1,102 lbs.) of lime to 1 cubic metre (1·308 cubic yards) of sand, mixed and beaten dry, has more resistance than an equal quantity of pure lime. A house-building mortar contains from 440 to 551 lbs. of lime per cubic metre (1·308 cubic yards) of sand. This is sufficient also for small arches and viaducts. For tunnels, foundations, and viaducts of considerable height the proportion of lime is increased by 110 lbs., while for important arches and dams subjected to pressure the amount of lime per unit of sand is from 661 to 771 lbs.

Stones or other cheap material are mixed with the mortar, thus constituting the béton. Cinders, coke, and furnace slag may be substituted for stones in ordinary house and wall work. If broken stone is used the pieces are from 0·78 to 2·36 inches in length. The proportions are usually two parts of stone for one of mortar for work under water; in open-air work the proportion of stone may be increased. For open-air work a coker or mould is built, into which the béton is poured in horizontal layers from 8 to 12 inches thick and then rammed. A layer of béton cannot be distributed above another which has already set until its surface has been picked and washed and finally given a coat of cement and water of the consistency of cream.

In both France and Germany a light-weight béton is made of cinders. Buildings several stories in height can be erected of this cinder béton, which can be laid as in the other cases cited or treated like armed cement. One-story structures require no anchorage bars. Several very large factories at Lyons have been built of this béton. Sometimes the cinders are worked into blocks and laid up like cut stone. In all cases the cinders must be screened and then mixed at the rate of 1 cubic yard of cinders to $\frac{1}{2}$ cubic yard of hydraulic mortar, composed of 440 lbs. of hydraulic lime to 35 cubic feet of sand, or the lime can be replaced by 330 lbs. of Portland cement. The proportion of mortar can be shaded slightly if the materials are good.

The striking economies effected in France are obtained by the free use of cheap local material, whatever it may be, and by the equally free use of lime where cement probably would be used in the United States. If the work be carefully planned and performed, hardly more lime is needed than if cement were used; and whereas a good Portland cement now costs from $10.22 to $10.60 per

ton in Marseilles, an equally good hydraulic lime costs but $6.35 per ton. In the rural districts the peasants use any kind of lime, and they build houses which last hundreds of years. Buildings constructed with béton can be completed by a coating of lime or cement mortar, which, being laid on and lined, gives a finish that loses little by comparison with cut stone, and effectually prevents the absorption of moisture.

THE PUBLIC AND ARCHITECTURE.

AT the International Congress of Architects last year various means were suggested of interesting the public in architecture, of rendering them sensible of the importance of having beautiful buildings in their midst, and of inculcating in the rising generation some intelligent understanding of what architecture is. A Paper contributed by some Spanish members of the Congress recommended the compulsory provision in primary schools of photographs or drawings showing the best existing specimens of architecture, with indications of style and epoch; the inclusion of æsthetics and of the history and theory of the fine arts in the general curriculum of schools; instruction in elementary architecture in schools of every kind; the establishment and endowment of chairs of architecture, and cheap excursions to notable buildings under the guidance of an architect who would lecture on the monuments visited.

The Press, too, we think, should be a powerful auxiliary in awakening and sustaining the interest of the people in the architecture of their cities. Occasional criticism of architectural works in the daily Press by a competent architect-writer would help on the movement considerably, and be of undoubted educative value. Perhaps, too, a little of the interest lavished on the painter, the sculptor, the musician, and the man of letters might be extended with advantage to the not less gifted architect.

Professor Aitchison, R.A., in one of his felicitous Presidential Addresses at the Institute, insists that concern for the architecture of one's country is a patriotic duty. "The poetry," he says, "the eloquence, and the music of the past become the cherished possessions of all civilised nations. The statues, the bas-reliefs, the engraved gems, the coins, the plate, and the jewellery are spread over the civilised world. The architectural monuments alone point out the places where the great life of the nation once throbbed, and enable us to penetrate the thoughts that created them and to see the skilled handiwork of the people. . . . It is only by the people cultivating a knowledge of architecture, and so appreciating its beauties and emotional qualities, that a love for its masterpieces can be engendered and the architect rewarded; for the architect's principal reward is the enthusiasm and gratitude his works excite."

It is a hopeful sign of the times and an encouragement to the rising generation of architects to read in the *Spectator* of a fortnight ago the admirable article entitled "Civic Pride." The inspiring theme was the possibilities that may result from the new scheme of historical teaching which is to be introduced into primary schools in London. The idea is to take the history of our great Metropolis as a whole, and to demonstrate the development of civic institutions and the place London holds in the history of the country. The *Spectator* makes it apparent that the average Londoner has lost all sense of civic pride, and that he compares most unfavourably in this regard with the provincial townsman. If Londoners were familiar with the greatness of their past, they would simultaneously understand the greatness of the responsibility it imposes upon them. Crosby Hall, which should be jealously guarded as a sacred relic preserved for us by our ancestors, is in danger, and it is left to a few cultivated citizens, whose enthusiasm may be mistaken for whimsicality, to agitate against its destruction. Here is a case where the expression of strong and widespread public feeling would have averted the danger at its very first threatening.

The *Spectator* instances a few points which might be rammed home in the process of cultivating in our children the virtue of civic pride. Concern for the appearance of London would be only one of several of its aspects. "Children should be told that, whatever London used to be, it is no longer an ugly place. Paris is beautiful for the arrangement of its vast spaces, but its public buildings do not match those of London. London grows in beauty yearly. This is a great building age, and our young architects are fast removing the blots upon their profession. Town children are often taught what they may observe in the country—where they seldom go—but if the faculty of observation be encouraged among the objects of a town, it will work automatically afterwards in all places and at all times. It can be encouraged first only on things which are continually before the eyes. Thus the buildings of London might become for the child an epitome of history. The child would be an exception to the present rule, and would go sight-seeing in his own city. He would learn the greatness of Wren; he would trace in old terraces the work or influence of the brothers Adam; he would learn that the Savoy is not only the name of an hotel and a theatre; he would appreciate the antiquarian learning of Mr. Gomme which evolved the splendidly apt names Kingsway and Aldwych and made all other suggestions look foolish; he would have an eye capable of seeing the beauty of New Scotland Yard." Here is something to hope for. When the dream of the *Spectator* is realised, we shall have moved on a pace.

REVIEWS.

HISTORY OF ARCHITECTURE.

A History of Architecture, having special regard to the natural artistic results of construction and those methods of design which are the result of abstract thinking and of the pure sense of form. By Russell Sturgis, A.M., Ph.D. Vol. I. Antiquity. 340 illustrations. La.8o. Lond. & New York. 1906. [B. T. Batsford, 94 High Holborn.]

In this work, which is a valuable addition to architectural literature, we have a painstaking and successful effort to combine in an attractive form personal observation and all the sources of information available, and to put them before the reader in a manner unusually free from the stereotyped form of a general architectural history. Its illustration is extremely well done by means of a large proportion of excellent photographs and by drawings mostly borrowed from other authorities. As one example among many of complete illustration of the points referred to in the text may be taken that of the Basilica of Shakka.

One might almost say that the very attractiveness of the book would prove its weakness from the point of view of the strenuous architectural student, who will perhaps look for something more technical, for more light on detailed designing and on æsthetic values. But he will also be greedy and ask for it with the sacrifice of little of the existing contents of these pages.

The plan of the book is admirably laid down and well carried out. Constructive details are not wanting, and are often admirably shown by carefully taken photographs, while due importance is given to the use of materials and their influence upon building.

The history and general development of the Greek and Roman orders naturally takes a large place in this volume, and historically they are interestingly treated; but methods and objects of design are not as much touched upon as one could wish, though one point is well brought out, which the student sometimes does not realise, that the Greek builders treated their design with much more freedom and variation than the study of stock examples leads him to believe.

Discussions as to principles of design are not always adequate or convincing. Take, for instance, the opinion expressed on the function of detail, or the dictum that without elaborate sculpture it (architecture) cannot reach its highest development.

It must be confessed that there are corrections which should, and will no doubt, be made in future editions. The writing is not always faultless, and the sense is somtimes obscure, as in the sentence on p. 144: "A theoretical reconstruction . . . long and narrow." Solutions of difficulties are not often attempted, but in one case where hopes are raised by the words: "Some suggestions are as follows, viz.," one suggestion only follows, with a note on oriental fenestration — which is disappointing. The confusion of the temple of Zeus at Olympia with the Parthenon, on p. 183, should not have escaped notice, nor such verbal slips, *inter alia*, as "border" for "order," or "four" for "three." In future editions M. Choisy's Egyptian book will of course have to be added to the books of reference.

For the complete understanding of architectural history the student must be familiar with the history of the builders themselves, and it is recognised in some universities where an architectural school exists that the study of the two should proceed *pari passu* under an architectural and an historical professor. It is impossible to expect a single author to undertake so huge a task, though, so far as it is attempted in these pages, the book gains by linking human interest to architectural achievement. It would not, however, be difficult, by references to a judicious and fairly complete list of works, to help the student to realise the important developments of various epochs, and this would be a great addition to any architectural history. But there should certainly be added to this volume a full index to the text as well as to the illustrations, and the latter would be rendered much more useful if they were more fully accompanied by scales, which are essential for plans, and especially valuable in the case of photographs of detail.

The amount of information crowded into these 425 pages is enormous, and the author would hardly be human if there were not some faults to find among them; but the history is graphically told and the interest unflagging, though where choice is difficult we should say that the beginning and end of the volume—the chapters on Egypt and Rome—were the most fascinating of all. The treatment of the illustrations in these chapters is in many respects the best, and if there is in the former some want of chronological clearness, the vastness of Egyptian periods, the continuous development along the lines of local tradition in spite of successive foreign occupations, is well brought out, and the appeal to the imagination is well made both in this and the story of Roman architecture and its connection with the spirit of imperial predominance and colonisation and expansion.

We look forward to the early production of Mr. Sturgis's other two volumes, and congratulate the author on a notable commencement to his history.

Manchester. PERCY S. WORTHINGTON.

9, Conduit Street, London, W., 19*th October* 1907.

CHRONICLE.

The Committee of Architects on St. Paul's.

In the note on St. Paul's Cathedral in the September issue of the Journal omission was inadvertently made of the President's name from the Committee of Architects who have recently reported upon the building. The Committee were appointed by the Dean and Chapter, and consisted of Mr. Thomas E. Collcutt, *President R.I.B.A.*; Sir Aston Webb, R.A., and Mr. John Belcher, A.R.A., *Past Presidents*; and Mr. Mervyn Macartney [*F.*], Surveyor to the Fabric.

Sessional Programme 1907-8.

The first meeting of the Session will be held Monday, 4th November, when the President, Mr. Thomas E. Collcutt, will deliver the Opening Address. Arrangements have been made for the reading of the following Papers during the Session: —18th Nov.: The Present Condition of St. Paul's Cathedral, by Mervyn Macartney [*F.*].—16th Dec.: Means of Escape from Fire in Modern Factories and Warehouse Buildings, with reference to the London Building Acts Amendment Act, by Wm. Woodward [*F.*].—20th Jan.: Royal Palaces in Scotland, by W. T. Oldrieve, F.S.A. Scot. [*F.*].—17th Feb.: Foundations, the Use of Divers, and the Grouting Machine, by Francis Fox, M.Inst. C.E. —16th March: A Modern Asylum: Bangour Village, near Edinburgh, by Hippolyte J. Blanc, R.S.A. [*F.*].—30th March: Theatre Planning.—13th April: The Designs for the London County Hall.—16th May: London Bridges, by Professor Beresford Pite [*F.*]. The President will deliver an Address to Students on 3rd February, when the Presentation of Prizes will take place. The Annual Exhibition of Drawings submitted in competition for the Prizes and Studentships in the gift of the Institute will be held from the 21st January to the 1st February.

Exhibition of Prix de Rome Drawings at the Institute.

By the courtesy of the French Government the President of the Institute has been able to arrange for the exhibition early in the Session of the beautiful drawings made by M. Jean Hulot during his tenure of the Grand Prix de Rome. The drawings, which have been on view at the Paris Salon, comprise a series of studies for the restoration of the Ruins of Selinus, Sicily.

The New County Hall Competition.

The following statement has been received from the London County Council:—

The London County Council has received from Mr. Norman Shaw, R.A., and Mr. W. E. Riley [*F.*], the two Assessors appointed to act for it in connection with the competition for designs for the new County Hall, their report on the result of the preliminary stage of the competition.

The Assessors state that there were sent in 99 designs, the work of 152 architects, some of whom worked independently and others in collaboration. Of these architects eight were of foreign birth. To illustrate the designs 1,199 drawings were submitted.

The duties of the Assessors were to select not less than 10 and not more than 15 designs with a view to the authors thereof competing, with the eight architects already selected by the Council, in the final stage of the competition.

There was no doubt in the minds of the Assessors that the maximum number (15) of designs required could be found among those sent in. The names of the 15 authors of designs selected by the Assessors are:—Mr. R. F. Atkinson [*F.*], Mr. H. J. Blanc [*F.*], R.S.A., Mr. G. Washington Browne, Mr. T. Davison [*A.*], Mr. M. J. Dawson [*A.*], Mr. J. B. Fulton [*A.*]. Messrs. Gardner & Hill, Mr. W. Haywood, Messrs. Houston & Horne, Messrs. Jemmett & McCombie, Mr. R. Knott, Messrs. A. Marshall Mackenzie [*F.*], A.R.S.A., & Son, Messrs. Russell & Cooper [*FF.*], Messrs. Warwick & Hall [*AA.*], Messrs. Clyde Young & E. W. Poley [*AA.*].

The names of the eight architects selected by the Council are:—Mr. J. Belcher, A.R.A., *Past President R.I.B.A.*, Mr. Wm. Flockhart [*F.*], Mr. Ernest George [*F.*], Mr. Henry T. Hare [*F.*], Mr. T. G. Jackson, R.A., Mr. E. L. Lutyens [*F.*], Mr. E. W. Mountford [*F.*], Messrs. Nicholson & Corlette (Sir Charles Nicholson, Bart., M.A. [*F.*], and Mr. H. C. Corlette [*F.*]).

Other architects of distinction were asked by the Council whether they were willing to compete, but they were unable to accept the invitation.

The committee dealing with the matter desire in the name of the Council to thank all the competitors for the response made to the Council's invitation, and for the great amount of work and thought which has been expended in maturing the designs submitted.

Several competitors have written asking for explanations of the rejection of their designs. To do this would practically necessitate a report from the Assessors on each design, and no such departure from the ordinary course as the requests imply can be made.

Crosby Hall Preservation Scheme.

The meeting held on the 1st inst. at the Mansion House, by invitation of the Lord Mayor, to consider ways and means of preserving Crosby Hall was attended by a large and representative company from the City Guilds and kindred institutions. The

Lord Mayor in opening the proceedings said he felt he should not be worthy of his office if he did not help the citizens to keep with them a cherished monument which had come down to them from the Middle Ages. Sir Vezey Strong, who afterwards took the chair, said their object was to preserve, if at all possible, the ancient portion of Crosby Hall, not only as one of the oldest and finest examples of the magnificence of the buildings of the Middle Ages, but that it might serve in the present day to be an appropriate, convenient, and worthy centre where the representatives of the old Guilds may meet the representatives of the new societies and organisations that are concerned in promoting the highest efficiency and social welfare of our workers, and helping forward the industrial progress of the nation. Discussing the financial position, Sir Vezey Strong said that the maximum cost of the freehold land which had to be acquired to exchange with the Bank for the land on which the old building stood was estimated to be £50,000. The maximum amount required to buy out the interests of leaseholders and compensate tenants for immediate disturbance was calculated at £60,000. The maximum amount required to make an alteration to a part of a house affected by the entrance to Great St. Helen's and to put the old hall and building in a state for occupation was £10,000. Of this sum of £120,000 it was proposed to raise part upon mortgage of the property itself, part from the contributions of the Guilds—particularly those which had been deprived of their halls to make way for the various City improvement schemes of recent times—and the remaining sum it was proposed to raise by public subscription. It was believed that this subscription from public sources would carry with it a wide, general, and continuing interest in the work which might in the future be carried on in the old building under the co-operative efforts and influences of the ancient Guilds and modern societies having kindred aims. The larger Guilds possessing halls of their own, like the Goldsmiths, the Fishmongers, the Carpenters, the Clothworkers, the Stationers, and others, were engaged in the objects for which they were originally founded, but they and other companies also contributed to maintain the great City and Guilds of London Institute for the promotion of technological and higher general education. But a number of the minor guilds—as the Clockmakers, Tylers and Bricklayers, Farriers, Turners, Spectacle-Makers, Needle-Makers, Paviors, Masons, Plumbers, and many others—were more directly engaged in promoting the training of members of their own craft and in other objects affecting the welfare of the national industries. Would it be too much to ask that for such a scheme the twelve principal companies, with large funds at their disposal, should contribute, say, £2,000 each? Following upon such a lead, might they not reasonably expect, say, £20,000 to be subscribed by the interested public, from whom they had already received several offers, and from the minor companies, who would conjointly derive the benefit already suggested, from which number they had already received the gratifying assurance of help, accompanied by a definite offer of £500 from the Plumbers' Company, to be supplemented by an annual donation of £100. If these suggestions were acted upon, this would leave a sum of £50,000 to be raised on mortgage, which could be secured without difficulty on sound commercial lines. The interest of this amount would be guaranteed by the participating companies and others interested by way of annual rental, leaving, with other commercial assets, such as the letting of the hall, &c., quite sufficient to meet rates and taxes and other outgoings. If this scheme were carried out, it was obvious that the Bank would receive in exchange for the site they surrendered one much more valuable commercially per square foot, in addition to which the number of feet would be about 400 in area, and it would not be unfair to expect payment of, say, at least £25,000.

Sir Vezey Strong expressed the indebtedness of the Preservation Committee to Mr. W. D. Caröe [*F.*], Architect to the Ecclesiastical Commissioners, who, he said, had most kindly and out of pure love for the subject made an exhaustive survey of the buildings. Mr. Caröe had been the means also of securing the interest of the Skinners' Company, the Commissioners of the City Parochial Foundation, and other freeholders, and had negotiated with the directors of the Chartered Bank in the interests of the scheme.

Mr. W. D. Caröe, addressing the meeting, said:—Crosby Hall is one of the few mediæval buildings we possess having an absolutely complete pedigree. From the date of its erection down to our own day we have an uninterrupted record of its detailed history, and the name of every one of its owners and occupiers—from High Sheriff Sir John Crosby, Richard III., and Sir Thomas More, down to the Chartered Bank of India, Australia, and China. Erected by a Sheriff of the City of London, it has three times been the property of a Lord Mayor. One of them held his Mayoralty in state within its walls. It has once before been in the occupation of a company of London merchants trading with the East Indies, who helped to preserve it for us. Its fate was as nearly sealed as at present in the year 1831, when it was rescued by some public-spirited men, and by the aid of public money was put into substantial structural repair by Mr. Blore, F.S.A., the architect to Westminster Abbey, and the leading expert in such work of his age. Funds falling short for the completion of its equipment, the late Miss Hackett stepped in, paid off arrears, and continued the work at her own cost. Finally, Mr. H. R. Williams and some two or three other influential City men brought the work to completion, and founded in it the Crosby Hall Literary and Scientific Institution. . . . . I am asked to give my views as to the condition of the build-

ing and its possibilities. I am glad to be able to report to you that the fabric is absolutely stable. It is safe to say that, if permitted to remain, it has an unlimited life before it. It has, of course, the mask of a modern restaurant over it, but that is only a thin veneer, which cannot cover the bed-rock facts, which are these: We have before us a piece of design and workmanship executed at a period when architecture was the first of the arts, and when the individual craftsmen were artists in the highest sense of the term—artists literally to their fingers' ends. It has a value of its own second to no other building in the City. As a piece of design, it may be held up for all time as a classic example of architectural skill and conception. To the architectural scholar it is a Gainsborough or a Reynolds in architecture. I refer specially to the balance of its parts; to the interdependence between windows and roofs; and very specially to the masterly manner in which the great oriel is managed. . . . . The building possesses a fine and dry vaultage undercroft or chamber, which continues from Great St. Helen's to Crosby Square, and has been used recently as a special banqueting hall. The north end of the hall is occupied by a four-storied building facing upon Great St. Helen's. Of this the lower part is ancient, and contains the ancient entrance door giving upon St. Helen's, formerly known as the Priory Close. This building was used as kitchens during the recent occupancy, and readily lends itself to adaptation to similar or fresh needs. There is also a room over the gallery at the south end which was formerly used as a lecture room; and there is a large roof space over the ceiling of the hall which can be brought into use. These buildings can be enlarged by raising, at small cost, if occasion demands, without in any way interfering with the Hall. If further accommodation for office or other needs is wanted it can be obtained. I have received from the Chartered Bank a letter saying that they have an option over an adjoining property, which they will be glad to transfer. That, I think, indicates their desire to aid our object very clearly. Let me close by asking those interested not to be dismayed by any reports they may hear as to those parts of the building adjacent to the Hall which have just been demolished. These were well known to us to have been erected in 1834, incorporating only the remains of two ancient walls once forming part of the chambers adjacent to the Hall. No injury has been done to the Hall itself by their disappearance, and no slight is to be cast on the Hall because these parts adjacent were not ancient. I would join in hoping for the success of this meeting, which gives the final opportunity for London to justify her civic pride, on behalf of which alone this appeal is worth making and working for. Other agencies have failed in securing the object for which we are assembled. The last chance of success lies only with the historic Guilds of the City of London. Sir Vezey Strong has shown in what direction success lies. It is a matter of co-operative effort and determination, and it is a rare occasion to which the Guilds will surely rise. As many of the Courts are held within a week from now, I would suggest finally that a deputation appointed by this meeting should wait upon the Bank to beg them to stay their hands for a few days until those meetings are held. Then success may have been achieved.

Sir William Dunn having dealt with the financial aspect of the matter, Mr. C. Sturge (Chairman of the Historical Records Sub-Committee, London County Council) proposed the following resolution, which was seconded by Colonel Pearson, and carried unanimously:—

"That this public meeting at the Mansion House, summoned to consider measures for the preservation of the historic building of Crosby Hall, heartily approves the scheme submitted to the meeting as explained by Alderman Sir Vezey Strong, Sir William Dunn, and Mr. W. D. Caröe, and pledges itself to support such scheme, and the appointment of a small committee under the presidency of the Lord Mayor (Sir William Treloar), to confer with the directors of the Chartered Bank of India, Australia, and China, and all the interests, with a view to carrying the scheme into effect."

The members of the Guilds present promised to submit the matter to their courts, with the recommendation that it should be favourably entertained.

Since the above meeting, a Fund has been opened by the Provisional Committee, and public subscriptions are invited, which should be paid to the credit of the "Crosby Hall Preservation Fund," Bank of England.

The Provisional Committee met at the Guildhall on 15th October, Sir Vezey Strong presiding. A communication was read from Lord Rosebery expressing strong sympathy with the effort being made to preserve the historic building. It was reported that the donations received and promised amounted to about £5000, spread over upwards of 300 contributors. Sir Vezey Strong and members of the Committee had an interview with the Chairman of the Chartered Bank, and proposed that in view of the generally favourable response to the Committee's appeal, and the growing public interest in the object, the Bank should grant an extension of time for donations to be received to the end of the present month.

The Board of Directors met on the 16th, and the following is an extract from a letter of the same date addressed from the Board to Sir Vezey Strong:—

"The directors learned with regret that your hopes of being able within the fortnight to raise such a sum as would render the successful accomplishment of your scheme probable have been disappointed. The fact that your exertions have hitherto only resulted in raising the small sum of £5000 appears to indicate that public interest in the matter is not sufficiently strong to justify any expectation that the large sum required for the fulfilment of

your project will be forthcoming; nor can the directors feel satisfied that your estimate of the probable cost is at all adequate. Even assuming that the necessary sum were raised, the directors cannot rely with any confidence upon obtaining vacant possession of the premises which you propose to substitute for the banqueting-hall, in time to permit of building operations being commenced before April 1 next. Apart from the serious inconvenience which this delay would cause, further heavy pecuniary loss would fall upon the bank.

"Weighty as these objections appear to the directors, they are unwilling to do anything which might prove prejudicial to the efforts of the committee, and they accordingly consent to the further extension of fourteen days asked for, on condition, as verbally agreed yesterday, that if at the end of that period you are not in a position to satisfy our legal advisers that the scheme can be carried through, it must be abandoned, and no further application be made to us on the subject."

The Bank of England, recognising the importance and the national character of the appeal, have allowed notices of the preservation scheme to be exhibited on the premises of the Bank.

Lord Avebury has accepted a seat on the General Committee.

Crosby Hall Fund: Donation from the Institute.

The following letter from the President of the Institute appeared in *The Times* of the 14th inst.:

SIR,—May I be permitted to suggest that, as the public are invited to subscribe towards the fund necessary for the preservation of Crosby Hall, some guarantee should be given that they should have access to view the building, at periods convenient to the various City Companies, who will probably be the joint occupiers?

I should like to add that the Royal Institute of British Architects have taken active steps towards the very desirable object of securing intact this fine example of the later Gothic work.

The Council of the Institute is now in recess, but I am venturing to offer on their behalf a donation of 100 guineas to the fund, on the understanding that some means may be found to secure to the public a right to visit the building at periods to be determined.—Your obedient servant,

THOS. E. COLLCUTT,
President R.I.B.A.

On the 15th inst. the following letter was addressed from the Institute to the Chairman of the Crosby Hall Provisional Committee:—

DEAR SIR,—I have the pleasure to inform you that the offer made by our President, Mr. Thomas E. Collcutt, in his letter to *The Times* of yesterday morning, was unanimously confirmed by the Council of the Royal Institute at their meeting yesterday afternoon, and I am directed by them to enclose you their cheque for 100 guineas on the condition mentioned in the President's letter, viz.: "That some means may be found to secure to the public a right to visit the building at periods to be determined."—I am, dear Sir, yours faithfully,

W. J. LOCKE,
Secretary R.I.B.A.

International Congress of Hygiene.

Mr. John Slater [*F.*], who with the President had been appointed by the Council to represent the Institute at the International Congress of Hygiene and Demography at Berlin, reports to the Council as follows:—

I beg leave to report, for the information of the Council, that I attended—as representing the R.I.B.A.—the meetings of the Fourteenth International Congress of Hygiene and Demography at Berlin. Much to my regret the President, who had intended to be present, was prevented from going.

The Congress was opened on Monday morning, 23rd September, under the presidency of Prince Heinrich zu Schönaich-Carolath, when the Minister for Fine Arts made an interesting speech explaining the aims and objects of the Congress, and welcoming the foreign delegates. Short speeches were also delivered by representatives of foreign countries. This meeting was honoured by the presence of His Royal and Imperial Highness the Crown Prince.

The sectional meetings, which were held in the Reichstagsgebäude, commenced on Tuesday, the 24th September, and were largely attended. The medical side of hygiene was much more prominent than the architectural. Crowded meetings were held, and animated discussions took place on "The Etiology of Tuberculosis," "State Control of Food-stuffs," "Infant Mortality," "Instruction in Hygiene for all Inspectors of Industries," and various other subjects of the greatest possible interest to the community at large.

In Section 6A an interesting discussion took place on the subject of the Provision of Dwellings for the Poorer Classes, the majority of the continental delegates being of opinion that the sites for such dwellings should be provided by the municipality, but that the actual erection of the buildings themselves should be left to private enterprise. Other subjects discussed in this section were "The Provision of Homes for Single Persons," and the "Hygienic Importance of various Modern Appliances for Artificial Lighting." In connection with the Congress there was a large and complete exhibition of all kinds of medical and hygienic apparatus, appliances, &c., sent in by Hygienic Institutes, public institutions, municipalities, and private firms, showing the most recent results of experimental and scientific investigation, and the best products of technical industry in the domain of hygiene.

The city of Berlin extended a warm welcome to all the delegates, and the social functions were numerous and admirably arranged.

The closing meeting was held on Sunday the 29th September, when it was decided to hold the next Hygiene Congress in Washington. Most brilliant weather prevailed during the whole time, and this largely contributed to the success of the Congress.

JOHN SLATER.
12th October 1907.

The Strand Frontage Question.

The London County Council have adopted the recommendation of its Improvement Committee, and have confirmed definitively its decisions of 20th October 1903 and 4th December 1906, to the effect that no alteration be made in the present northern line of frontage in the Strand between Wellington Street and the Law Courts. They state that in their opinion no suggestion has been made which offers sufficient advantage to justify the Council in incurring the heavy loss which would be involved in increasing the already adequate width (100 feet) of the portion of the thoroughfare in question.

London Improvements.

Extensive improvements are being carried out at Constitution Hill and at the Wellington Arch, through which the thoroughfare leads to Hyde Park Corner. In about two years the Mall will be opened into Charing Cross, and much of the light traffic which now goes westward by Piccadilly will then be diverted along the Mall and Constitution Hill; and it is in view of this increased traffic that the width of the road from Buckingham Palace to the Wellington Arch is being increased from about 50 feet to 95 feet. Between the wall of Buckingham Palace Gardens and the railings on the south side of Constitution Hill there has hitherto been some ten or twelve feet of grass and a row of trees. Under the new scheme this space will form part of a footpath 15 feet wide, the wall forming the south boundary of the road. For wheel traffic 50 feet have been allotted instead of, as at present, about 30 feet. Upon the north side the railings have been thrown back into the Green Park to allow for a new ride 30 feet in width. The path on this side of the road will be inside the park railings. The "bottle-neck" entrance from the Wellington Arch is to be altered so as to prevent congestion as far as possible. On the eastern side of the arch, instead of a somewhat cramped space, there will be a square 145 feet from west to east and 150 feet from north to south. The boundaries of this square will be low walls surmounted by iron railings, and at each of the corners will be erected stone pillars of a style in keeping with the arch. The work, which is being carried out under the direction of the Office of Works, will cost £18,000.

The Parliamentary Committee of the St. Pancras Borough Council in a report just issued state that they have considered a letter from the London County Council pointing out that a favourable opportunity has arisen for the formation of a new street between Gray's Inn Road and Pentonville Road at a point opposite Caledonian Road, by a bridge across the centre of the Metropolitan Railway Company's King Cross Station. The company are proposing to alter the station and booking offices, and, as a result of preliminary negotiations, it appears that the cost of the complete improvement may be estimated at £40,000, which the company consider reasonable. The Improvements Committee of the County Council propose that a street 60 feet wide should be constructed, and they consider that by this means the congestion of traffic at the junction of Gray's Inn and Pentonville Roads will be relieved.

National Portrait Gallery: Contemplated Extension.

In the House of Lords recently Lord Weardale asked His Majesty's Government whether they were aware of the grave fire and other risks to which the National Portrait Gallery was exposed by reason of the close proximity of the canteen and prison belonging to St. George's Barracks, and whether they would take steps, as in the case of the National Gallery, to isolate the National Portrait Gallery by the transference of these buildings to some other position in the area occupied by the barracks; and whether His Majesty's Government would, in the event of a decision to remove the barracks to some other locality, have due regard in the allocation of the vacant space to the claims of the National Portrait Gallery, and the urgent necessity for some increase in the accommodation provided for the national collection of portraits. The Earl of Portsmouth, in reply, said he had gone very carefully into this matter, because he sympathised very much with the object of Lord Weardale. The Government were not prepared, however, to admit that the proximity of the St. George's Barracks involved greater danger than that of other buildings in the neighbourhood. The Garrick public-house was really nearer to the National Portrait Gallery than the canteen of the barracks. The St. George's Barracks, however, were entirely inadequate and unsuitable for their present purpose as a central recruiting depot in London, and another site had been selected in Old Scotland Yard, with the view of new buildings being erected thereon by the Office of Works. The recruiting authorities at the War Office were willing on these conditions to vacate St. George's Barracks when the new buildings were ready. Lord Weardale pointed out that quite recently a fire broke out in the canteen in question, which abutted upon the National Portrait Gallery. The matter was of some urgency and ought to be attended to at once. Lord Allendale said he had been asked by the First Commissioner of Works to state that Mr. Harcourt hoped, when the military buildings for recruiting purposes were provided in Old Scotland Yard, there would be facilities for an extension of the existing buildings of the National Portrait Gallery. The negotiations were now proceeding, and it was anticipated that the matter would be settled in the course of the next few months. The Earl of Donoughmore expressed the hope that the new barracks would be buildings worthy of the Army.

International Congress of Architects, Vienna, 1908.

The programme so far arranged is as follows :—

Monday, 18*th May*.—Meeting in hall of the Architects' and Engineers' Association.—Public opening of the Congress in the Assembly Hall of the Imperial Palace.—Excursions through the City.—Reunion in the Künstlerhaus in the Fine Arts Palace; entertainment by the Sculptural Society of Vienna.

Tuesday, 19*th May*.—First section in the hall of the Engineers' and Architects' Association of Vienna; second section in the Trades Union Hall.—Conferences with Professor Karl Konig and Mr. Bauer.—Visit to the Exposition of Prater; excursion to Kahlenberg.—Dinner given by the Austrian Society of Engineers and Architects.

Wednesday, 20*th May*.—Business meetings and conferences in the halls as above.—Excursion to Klosternenberg and to the Château of Kreutzenstein.—Reception at the Imperial Court.

Thursday, 21*st May*.—The entire day to be devoted to an excursion to Semmering.

Friday, 22*nd May*.—Business meetings and conferences.—Visit to the city library.—Reception in the Rathaus.

Saturday, 23*rd May*.—Closing meeting.—Promenades, visits, &c.—Closing banquet.

The following subjects are to be discussed :

(1) State of Legislation on Copyright in Design; (2) Organisation of International Competitions in Architecture; (3) The Legal Qualification of an Architect; (4) Preservation of Public Architectural Monuments; (5) Reinforced Concrete Construction; (6) The Public Administration of the Fine Arts: the Utility of, the Dangers of, and the Methods of Organisation; (7) To Safeguard the Artistic Interest in Municipal Building Ordinances; (8) The Modification of the Business Methods of the International Congress.

Papers are promised by Professor Karl Konig on the Influences and Tendencies of Modern Art on Architecture; by Mr. Leopold Bauer on the Influence of Historic Styles on the Development and Forms of Modern Architecture; by Professor Meydenbauer, Berlin, on Measurements of Light; by M. Daumet, Paris, on the subject of Architecture.

School of Art Wood-carving.

We are asked to announce that the School of Art Wood-carving, South Kensington, which now occupies rooms on the top floor of the new building of the Royal School of Art Needlework in Exhibition Road, has been re-opened after the usual summer vacation, and that some of the free studentships maintained by means of funds granted to the school by the London County Council are vacant. The day classes of the school are held from 10 to 1 and 2 to 5 on five days of the week, and from 10 to 1 on Saturdays. The evening class meets on three evenings a week and on Saturday afternoons. Forms of application for the free studentships and any further particulars may be obtained from the manager.

The late William Leck [*F.*].

Mr. Arthur H. Reid [*F.*], Hon. Sec. R.I.B.A. for S. Africa, kindly contributes the following notice :—

To the regret of all who knew him, William Leck died at Durban, Natal, from an attack of pneumonia on 9th August 1907, aged about fifty-five years, and was interred at Johannesburg, Transvaal Colony, on 12th August.

Commencing in 1870, Mr. Leck served a five years' apprenticeship with the late Mr. Francis Stirrat in Belfast, and afterwards assisted Messrs. Thomson & Turnbull, J. Burnet & Son (Glasgow), Fred Wheeler, the late William Young, and Ernest George & Peto. He was a student at the Royal Academy Schools. In 1889 he migrated to the Transvaal Republic and opened an office in Pretoria, subsequently settling in Johannesburg, where he was latterly associated with Mr. Frank Emley. He was elected a Fellow of the Royal Institute of British Architects in 1904, and served as President of the Transvaal Institute of Architects with the utmost distinction. He was an active worker in the South African Association for the Advancement of Science, and an able contributor to many publications of a scientific and artistic nature.

A lover of peace, Mr. Leck persistently refused to enter the arena of public life, and this resolution left him in such an uncompromised position that his independent, shrewd, and kindly advice was often sought by his professional brethren and friends when troubles arose. Among his principal works at Johannesburg are the Rand Club, New Stock Exchange, Eckstein's Buildings, with the adjoining National Bank and the Public Library, though these by no means cover the extent of his works in and around Johannesburg, where he did his share to convert a wilderness into one of the most desirable and beautiful centres of modern civilisation.

His funeral was largely attended by all grades of local society, and the following professional brethren were present or represented :—Messrs. Baker & Masey, Beardwood, Cottrill, Clayton, Dickson, Emley, Hosking, Reid & East, Stokes & Stucke, while tokens of respect were sent by the Transvaal Institute of Architects, Transvaal Society of Quantity Surveyors, Johannesburg Master Builders' Association, Caledonian Society, Young Men's Christian Association, Town Council, Chamber of Commerce, Chamber of Mines, Rand Club, and many other local institutions that the deceased had interested himself in. He lived respected and died regretted by all.